

AGREEMENT

BETWEEN
THE STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION
AND
THE REGENTS OF THE UNIVERSITY OF CALIFORNIA, BERKELEY

THIS AGREEMENT is made and entered into 12th September, 2003, between the STATE OF ARIZONA, acting by and through its DEPARTMENT OF TRANSPORTATION (the "Arizona DOT") and the REGENTS OF THE UNIVERSITY OF CALIFORNIA, BERKELEY (the "University-Berkeley")

I. RECITALS

1 The Arizona DOT is empowered by Arizona Revised Statutes Section 28-401 to enter into this agreement and has delegated to the undersigned the authority to execute this agreement on behalf of the Arizona DOT

2 The University-Berkeley is empowered by to enter into this agreement and has delegated to the undersigned the authority to execute this agreement on behalf of the University

3 The Pacific Coast Conference on Asphalt Specifications (PCCAS) by Resolution, attached hereto and made a part hereof, has designated the Arizona DOT as the lead agency for facilitating the funding obligations of the contributing States of the PCCAS for the Research and Development Study for "Evaluation of the Influences of Asphalt Binders on Mixed Fatigue", in which to examine the influence of a range of asphalt types (nine different asphalt grades) on the laboratory simulated fatigue response of various asphalt pavements in different climates. Those States include Arizona, California, Nevada, Oregon, Washington and Hawaii (the "Contributing States")

4 The Arizona DOT and the Federal Highway Administration (FHWA) have executed a Cooperative Agreement (Pooled Fund Project #TPF-5 (018)), attached hereto by reference, establishing the Arizona DOT as the mechanism to "Pass-Through" the funding obligations of the contributing States of the PCCAS, a total sum of \$82,286 00 on behalf of the PCCAS

5 The purpose of this agreement is to outline the responsibilities of the Arizona DOT and the University-Berkeley, collectively (the "Parties"), in facilitating the discovery, dissemination and application of new knowledge, associated with the Research and Development Study for "Evaluation of the Influences of Asphalt Binders on Mixed Fatigue", hereinafter referred to as the "Pooled Fund Study".

THEREFORE, in consideration of the mutual covenants expressed herein, it is agreed as follows

NO. 26339
Filed with the Secretary of State
Date Filed: 09/25/03

Janice K. Brewer
Secretary of State

By: Daniel D. Gruenewald

II. SCOPE OF THE WORK

a. The Parties desires to participate in the research and development of the Pooled Fund Study in accordance with its proposal entitled "Evaluation of the Influences of Asphalt Binders on Mixed Concrete, attached hereto and incorporated herein as Exhibit A, collectively referred to as the "Project".

b. The Arizona DOT, in accordance with Exhibit A and on behalf of the PCCAS, will be the lead agency for facilitating the funding obligations of the contributing States, referenced herein, in an amount not to exceed of \$82,286.00.

c. The Contributing States will provide funds not to exceed \$82,286 as follows:

- California \$15,000
- Arizona \$15,000
- Oregon \$10,000
- Washington \$15,000
- Nevada \$13,000
- Hawaii \$14,286

b. The University-Berkeley in accordance with Exhibit A, will perform laboratory studies, analyze, evaluate and develop information on the relationship between asphalt binder properties and pavement fatigue performance.

III. PERIOD OF PERFORMANCE

The period of performance of this agreement will be from August 15, 2003 through May 31, 2004 unless extended by mutual agreement or terminated in accordance with Article XIV

IV. COST AND PAYMENT

a. The total cost of this agreement shall not exceed \$82,286. The University-Berkeley will invoice the Arizona DOT when payment is due, included with detailed documentation and the Arizona DOT Form 12-6903 R7/87, for requesting payments to be approved by the Arizona DOT. If a copy of this form has not been provided, one can be obtained electronically by calling (602) 712-8088. The Arizona DOT will submit invoice to FHWA and will reimburse the University-Berkeley upon receipt of payment from FHWA. Payment should be mailed to Extramural Funds Accounting, 481 University Hall #1103, University of California, Berkeley, CA 94720-1103

b. If, at any time, The University-Berkeley has reason to believe that the cost of the work will exceed the amount set forth in Paragraph "A" above, the University-Berkeley will notify the Arizona DOT in writing, giving a revised budget for completion of the work. The Arizona DOT will not be obligated to reimburse the University-Berkeley for any cost in excess of the amount set forth in Paragraph "A" and the University-Berkeley will not be obligated to continue the work or incur costs in excess of that amount unless and until this agreement is amended to increase the maximum amount

c. Upon expiration or termination of this agreement, the University-Berkeley shall provide a final report of expenditures to the Arizona DOT and return any unexpended or uncommitted funds.

V. PROJECT MANAGEMENT

A. The work will be under the direction of the University-Berkeley's principal investigator, Carl Monismith. No substitution may be made for the University-Berkeley's principal investigator without the prior written concurrence of Arizona DOT

B. The University-Berkeley agrees to permit the Arizona DOT's representatives to confer as necessary with the University-Berkeley's principal investigator. It is understood and agreed that Arizona DOT's representatives have no authority to supervise, direct or control the work performed hereunder

VI. CONFIDENTIALITY

It is contemplated that the work of this agreement can be carried out without disclosing any of Arizona DOT's confidential information to the University-Berkeley. However, should it become necessary to disclose Arizona DOT's confidential information, the Arizona DOT will notify the University-Berkeley in advance and in writing, within thirty days of disclosure. Arizona DOT's confidential information will be clearly marked as such in writing. If information is orally disclosed which is deemed or desired to be confidential, such confidential information must be reduced to writing by the Arizona DOT within thirty (30) days of oral disclosure and provided to the University-Berkeley.

VII. PUBLICATION

The Parties herein will have the right to publish, disclose, disseminate and use, in whole and in part, any data or information received or developed under this agreement. However, any material to be copyrighted will be copyrighted in the name of the Pacific Coast Conference. Copies of any proposed publication will be provided to Arizona DOT, as lead agency, thirty (30) days prior to submission for Arizona DOT's review, comment, and identification of any of Arizona DOT's proprietary data which has inadvertently been included and which the Arizona DOT wishes to have deleted. Title to all documents, reports and other deliverables prepared by the University-Berkeley in performance of this agreement shall rest with the Arizona DOT on behalf of the Pacific Coast Conference on Asphalt Specifications.

VIII. REPORTING REQUIREMENTS

The University-Berkeley's principal investigator shall submit annual technical reports to the Arizona DOT within 60 days of the end of each year of the project and will submit a final technical report to the Arizona DOT within 90 days of termination of the Project. A final financial report will also be submitted to the Arizona DOT within 90 days of termination of the Project.

IX. PATENT RIGHTS

The University-Berkeley will promptly disclose to the Arizona DOT in writing and marked "Confidential" any inventions or discoveries arising under this agreement, and the Arizona DOT will advise the University-Berkeley in writing within thirty (30) days of disclosure to the Arizona DOT whether or not it wishes to secure from the University-Berkeley a license or option to use such invention or discovery. If the Arizona DOT elects not to secure such license or option, rights to the inventions or discoveries disclosed hereunder will be disposed of in accordance with the University-Berkeley's policies. Should use of the data produce income, then that income should flow to the Arizona DOT for distribution to the participants of the contributing States.

X. RECORD RETENTION

Financial records, supporting documents and other record pertaining to this agreement shall be maintained and retained by the University-Berkeley for a period of three years from the termination date of this agreement.

XI. INDEMNIFICATION

The University-Berkeley shall defend, indemnify and hold the Arizona DOT, its officers, employees and agents harmless from and against any and all liability, loss, expense (including reasonable attorneys' fees), or claims for injury or damages arising out of the performance of this agreement but only in proportion to and to the extent such liability, loss, expense, attorneys' fees, or

claims for injury or damages are caused by or result from the negligent or intentional acts or omissions of the University-Berkeley, its officers, agents, or employees

XII. USE OF NAMES AND TRADEMARKS

The Parties agree that neither will use the name of the other party or its employees in any advertisement, press release or publicity with reference to this agreement or any product or service resulting from this agreement, without prior written approval of the other party

XIII. NOTICES / CONTACTS

Any notice given hereunder, will be in writing and sent to the following addresses:

For Administrative Matters

University of California at Berkeley
Sponsored Projects Office
336 Sproul Hall #5940
Berkeley, CA 94720-5940
Attention: David Garcia
(510) 643-3391
dgarcia@uclink.berkeley.edu

Arizona Department of Transportation
Joint Project Administration
205 S. 17th Avenue – MD 616E
Phoenix, AZ 85007
Attention: Joint Project Administrator
(602-712-7525 X-8088)
lgrandy@dot.state.az.us

For Technical Matters

University of California, Berkeley
Carl Monismith
Department of Civil Engineering
215 McLaughlin Hall
Berkeley, California 94720-1712
(510) 642-9067
monismith@ce.berkeley.edu

Arizona Department of Transportation
George Way
Materials Group
206 S. 17th Avenue – MD 068R
Phoenix, AZ 85007
(602-712-8085)
gway@dot.state.az.us

XIV. TERMINATION

Either party may terminate this agreement upon thirty-days advance written notice to the other party. In the event of such termination, the University-Berkeley will refund all unexpended and unobligated funds to the Arizona DOT after withholding amounts necessary to discharge uncancellable obligations.

XV. MISCELLANEOUS PROVISIONS

A. This agreement shall become effective upon signature and final date by the parties

B. The terms and conditions of this agreement shall remain in force and effect until on or about 31 May 2004, or upon completion of said Project and reimbursements; provided, however, that this agreement, may be cancelled at any time prior to the commencement of performance under this agreement, upon thirty-days written notice to the other party.

C. The parties agree to comply with all applicable state and federal laws, rules, regulations and executive orders governing equal employment opportunity, immigration, nondiscrimination and affirmative action

D. Arbitration. In the event of any dispute, claim, question, or disagreement arising from or relating to this agreement or the breach thereof, the parties hereto shall use their best efforts to settle the dispute, claim, question, or disagreement. To this effect, they shall consult and negotiate with each other in good

faith and, recognizing their mutual interests, attempt to reach a just and equitable solution satisfactory to both parties. If they do not reach such solution within a period of 60 days, then, upon notice by either party to the other, all disputes, claims, questions, or differences shall be finally settled by arbitration administered by the American Arbitration Association in accordance with the provisions of its Commercial Arbitration Rules.

E. Nondiscrimination. The parties agree to comply with all applicable state and federal laws, rules, regulations and executive orders governing equal employment opportunity, nondiscrimination and affirmative action.

F. Non-Availability of Funds: Every payment obligation of State under this contract is conditioned upon the availability of funds appropriated or allocated for the payment of such obligation. If funds are not allocated and available for the continuance of this contract, this contract may be terminated by the State at the end of the period for which the funds are available. No liability shall accrue to the State in the event this provision is exercised, and the State shall not be obligated or liable for any future payments or for any damages as a result of termination under this paragraph.

XVII. SCOPE OF THIS AGREEMENT

This agreement states the entire contract between the parties as of the date of final signature below in respect to the subject matter of the agreement and supersedes any previous written or oral representations, statements, negotiations, or agreements. This agreement may be modified only by written amendment executed by the authorized representatives of both parties.

IN WITNESS WHEREOF, the parties hereto have caused this agreement to be executed by their duly authorized representatives

STATE OF ARIZONA
DEPARTMENT OF TRANSPORTATION

By: Douglas A. Forstie
DOUGLAS A. FORSTIE, P.E.
Acting Deputy State Engineer

Date: 09-04-03

**REGENTS OF THE UNIVERSITY OF
CALIFORNIA, BERKELEY**

By: David Garcia
DAVID GARCIA
Acting Assistant Director, Non-Federal
Programs
Sponsored Projects Office
University of California
Berkeley Campus

Date: 8/27/03



TERRY GODDARD
ATTORNEY GENERAL

OFFICE OF THE ATTORNEY GENERAL
STATE OF ARIZONA

TRANSPORTATION SECTION
WRITER'S DIRECT NO: 602.542.8837

INTERGOVERNMENTAL AGREEMENT
DETERMINATION

A.G. Contract No. KR03-1192-TRN, an agreement between public agencies, has been reviewed pursuant to A.R.S. § 11-952, as amended, by the undersigned Assistant Attorney General who has determined that it is in the proper form and is within the powers and authority granted to the State of Arizona.

No opinion is expressed as to the authority of the remaining parties, other than the State or its agencies, to enter into said agreement.

Date: 12 September 2003

Terry Goddard
ATTORNEY GENERAL

A handwritten signature in black ink, reading "James R. Redpath", written over a horizontal line.

James R. Redpath
Assistant Attorney General
Transportation Section

JRR:djd

Exhibit A

Pooled Fund Study

Evaluation of the Influences of
Asphalt Binders on Mix Fatigue

To:

Arizona Department of Transportation
ATTN: Mr. George Way

Proposal Prepared by:
Professor C. L. Monismith

Purpose

The purpose of this study is to examine the influence of a range of binder types on the simulated fatigue response of pavement structures of various thicknesses in representative environmental regions of the Pacific Region. Results of the investigation should assist the Asphalt Binder Committee of the Pacific Coast Conference on Asphalt Specifications (PCCAS) in its deliberations relative to the performance-graded (PG) binder specifications as defined in AASHTO MP1-93, Specifications on Performance Graded Asphalt Binder.

Background

In a study reported in the 1997 Association of Paving Technologists (AAPT) Proceedings (1) and presented earlier to both the Binder and Mix Committees of the PCCAS, an extensive analysis of mixes containing 8 Materials Reference Library (MRL) binders and 2 MRL aggregates indicated that the specification parameter $G^* \cdot \sin \delta$ did not properly reflect pavement performance with respect to fatigue cracking. This finding was supported by research presented by the Federal Highway Administration (FHWA) staff at the 2000 meeting of the AAPT in Reno (2). The study presented the results of full-scale accelerated loading tests on a series of pavement structures containing a number of different binders at the Turner Fairbank Highway Center.

Both studies suggest that the limits placed on the parameter $G^* \cdot \sin \delta$ are not applicable to pavements containing asphalt layers greater than about 75 mm (3 in.) in thickness. Thus to

provide guidance to the Binder Committee, in its deliberations of the PG-grading system, the study proposed herein is designed to examine the fatigue response of mixes containing a range of binders and the behavior of these mixes in a range of pavement structures in representative environments of the Pacific Region.

Proposed Investigation

This investigation includes the following:

1. Chemical analysis (molecular weight distribution) of the asphalt binders by the Western Research Institute (WRI). This study will be funded by the FHWA and is a part of the contributed funding by the participants in the PCCAS.
2. Rheologic studies of the binders – each binder supplier will provide the results of rheologic tests for the dynamic stiffness of the binders covering a range in times of loading (frequencies) and temperatures. In addition, binders will be supplied to the FHWA to perform the regular AASHTO MP1 tests and to the University of Wisconsin to perform some of the tests under development in NCHRP Project 9-10.
3. Fatigue studies will be conducted on mixes containing the binders and one aggregate – Watsonville Granite. The fatigue studies will be performed over a range of temperatures.
4. Pavement analyses, using the fatigue test data and a range of traffic and environmental conditions representative of the states comprising the PCCAS will be conducted.

5. Statistical analyses of the results of binder and mix tests and estimates of pavement performance to define which binder parameter(s), if any, provide a measure of fatigue performance.

Binders

Nine (9) binders¹ covering a range in binder types and PG-gradings have been selected for use in the study by the Paving Asphalt Committee of the PCCAS. Included are the following:

<i>Asphalt</i>	<i>Supplier</i>
PG 64-22	US Oil
PG 64-28	Chevron
PG 70-28	Koch
AC-20P	Koch
PG 52-28	Williams
PG 76-16	Chevron (El Paso – Airblown)
PBA 6A (PG 64-34)	Huntway
CA Coastal AR 4000 (PG 64-16)	Oxnard
SJV AR 4000 (PG 64-10)	San Joaquin Refining

Binder test data will be supplied, as noted above, by the participants in the PCCAS. Required data are:

- G^* and δ over a range in frequencies at temperatures (say three or four) from 5° C to 30° C
- data for each binder as required in the AASHTO MP-1 binder specification
- data on the asphalts sufficient to develop relaxation spectra similar to that reported by L. Zanzotto et al. in Reference (3).

¹ Some crumb rubber modified (CRM binders will also be included in the study with funding for this part of the study obtained from another source

- data obtained from tests performed by Dr. Hussain Bahia developed under the aegis of NCHRP Project 9-10 (5).

Mixes

To minimize testing, only one aggregate will be utilized, a Watsonville granite. It is recommended that the grading shown in Figure 1 be utilized². Further, one binder content will be used for each of the mixes. The mixes would be compacted by rolling compaction in slabs approximately 61 cm by 61 cm (2 ft by 2 ft) in plan and approximately 75 mm (3 in) thick to an air void content of 6 ± 0.5 percent.

In addition to the basic study, 3 binders will be selected for a series of tests at 2 additional binder and air void contents.

Mix Tests

Flexural-fatigue tests using that SHRP-developed fatigue equipment would be used to define the fatigue response of the nine mixes. Specimen size is 40 cm (16 in) long by 6.4 cm (2.5 in) wide by 5.1 cm (2.0 in) high obtained by sawing from the compacted slabs.

Following practice recommended in Reference (4), 3 specimens would be tested at each of 2 strain levels and 3 temperatures: 10° C, 20° C, and 30° C. One frequency, 10 Hz, would be used for the tests.

The experiment would thus require a total of about 200 specimens, as follows:

- Primary experiment: No. of specimens = (1) aggregate x (9) asphalts x (1) binder content x (3) temperatures x (3) specimens x (2) strain levels = 162

² Grading used in study reported in Reference (1).

- Auxiliary study: No. of specimens = (1) aggregate x (3) asphalts x (2) binder content x (1) temperature x (3) specimens x (1) strain level x (2) air void contents = 36

Analyses

Analyses of the performance of the mixes for a range in pavement structures would be accomplished according to the procedure described in Reference (1).

Five representative environments for the Pacific Region would be utilized. It is anticipated that regions evaluated in the study reported in Reference (1) should cover the majority of the environments encountered. Nevertheless a study of environmental data from Washington, Arizona, Oregon, Nevada, Alaska, and Hawaii will be evaluated before proceeding.

Fatigue performance as a function of various binder parameters vs. traffic (represented by various structural pavements) and environment will then be evaluated following the methodology of Reference (1), an example of which is shown in figure 2. From these analyses, guidance should be forthcoming for appropriate (if any) specification requirements for fatigue.

Staff, Facilities and Cost Sharing Aspects

The investigation will be conducted under the direction of Professor C. L. Monismith, whose bio-data is attached. Professor Monismith's time will be contributed as a cost sharing element. The fatigue testing of the mixes will be done at the Pavement Research Center's laboratory at the Richmond Field Station of the University of California. Binder tests will be accomplished by the binder supplies, the FHWA (Turner Fairbank Highway Research Center), Western Research

Center (Laramie, WY), and the University of Wisconsin, Madison. The entire binder testing program represents the other cost sharing feature and involves the supply of binder test data for the proposed analyses.

References

1. Deacon, J. A., J. T. Harvey, A. Tayebali, and C. L. Monismith, "Influence of Binder Loss Modulus on the Fatigue Performance of Asphalt Concrete Pavements." **Journal of the Association of Asphalt Paving Technologists**, Vol. 66, 1997, pp. 633-685.
2. Romero, P. K., D. Stuart, and W. Mogawer, "Fatigue Response of Asphalt Mixtures Tested by FHWA's ALF," **Journal of the Association of Asphalt Paving Technologists**, Vol. 69, 2000, pp. 212-235.
3. Stastna, J., L. Zanzotto, and K. Ho, "Structural Complex Modulus Manifested in Asphalts," **Rheol Acta** 33: 344-354, 1994.
4. Tayebali, A., J. A. Deacon, J. S. Coplantz, F. N. Finn, and C. L. Monismith, "Part II Extended Test Program," the **Fatigue Response of Asphalt-Aggregate Mixes**, SHRP-A-404 Strategic Highway Research Program, National Research Council, Washington D. C., 1994.
5. Bahia, H., H. Zhai, M. Zeng, Y. Hu, and P. Turner, "Development of Binder Specification Parameters Based on Characterization of Damage Behavior," **Journal of the Association of Asphalt Paving Technologists**, Vol. 70, 2001 (in print).

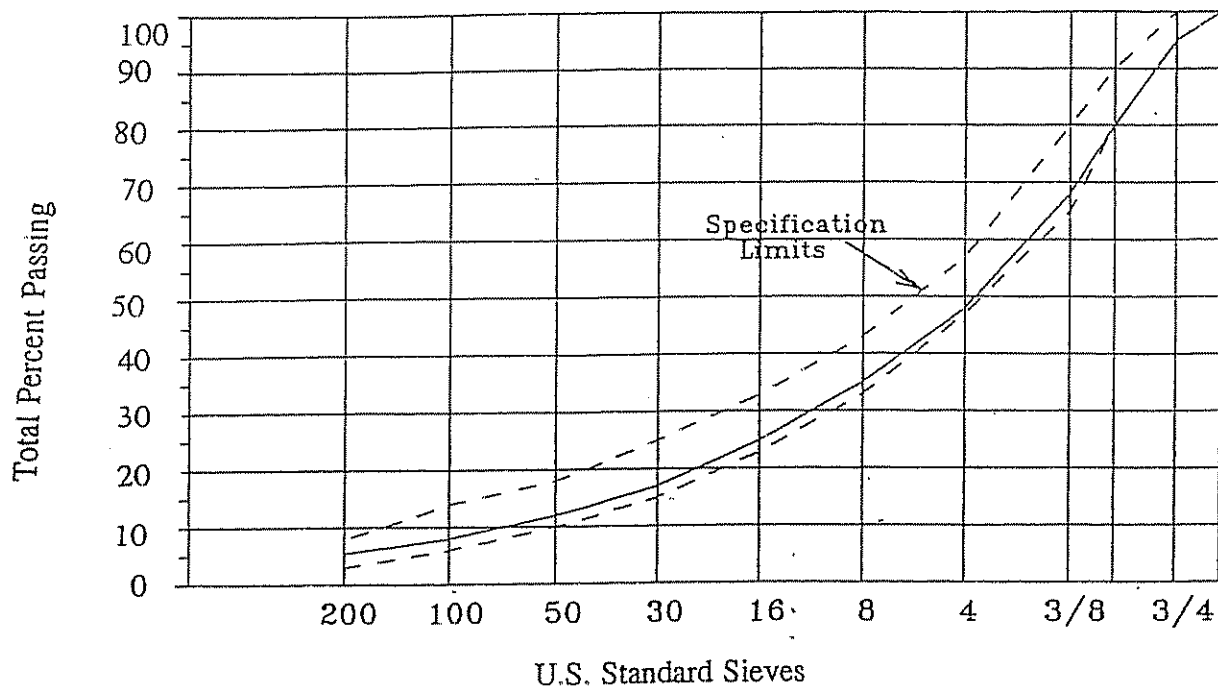


Figure 1. Proposed aggregate gradation

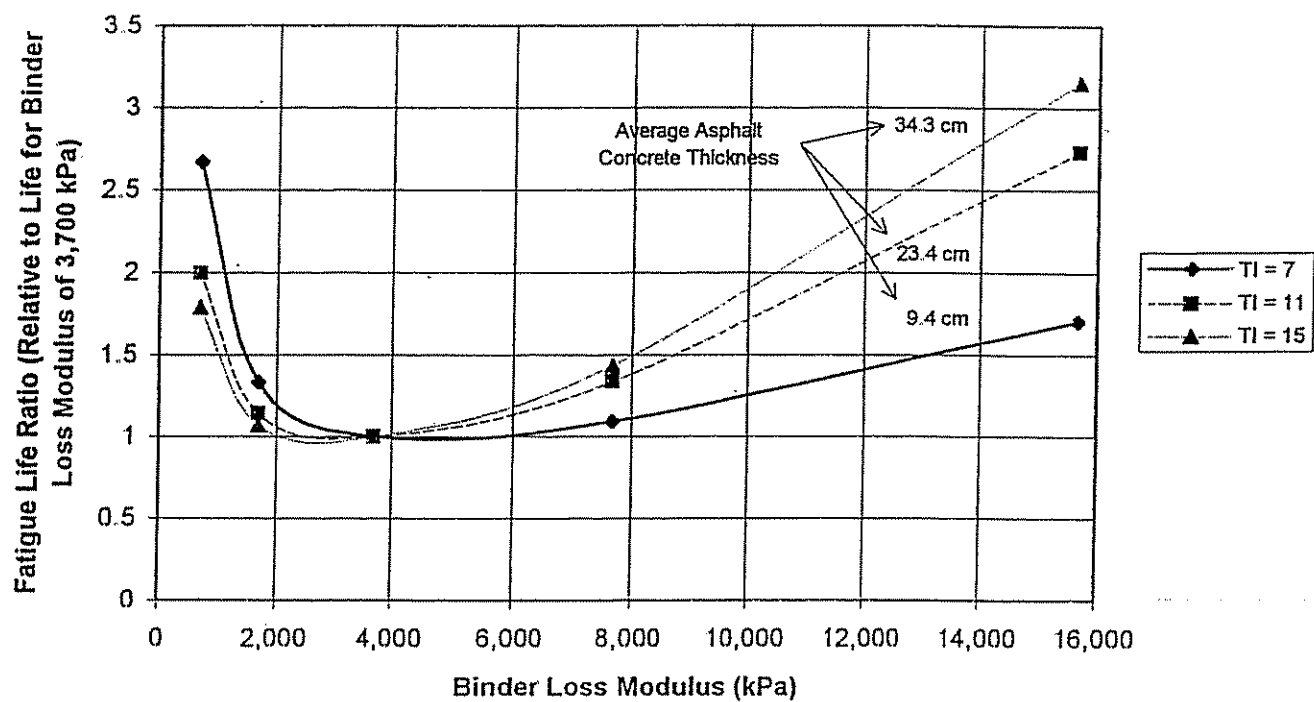


Figure 2. Relationship between average fatigue life ratio and binder loss modulus for 18 hypothetical pavement structures

Budget

Attached is the estimated budget required to complete the project. Mix testing and analyses will be performed by staff of the Pavement Research Center under the direction of Professor C. L. Monismith who will prepare the final report to be submitted to the PCCAS. A brief summary of Prof. Monismith's experience is appended.

Reports

These will be two reports prepared in conjunction with the project. On June 2002, a progress report will be prepared and submitted to the sponsoring agency. At the conclusion of the project, a final report summarizing and evaluating the binder data as well as mix performance containing the different binders will be prepared. This report will contain recommendations for modifications to the AASHTO MP-1 asphalt binder specifications.

Prof. Carl Monismith

Since 1951, Professor Carl L. Monismith has been a member of the staff of the Department of Civil Engineering and the Institute of Transportation Studies (formerly the Institute of Transportation and Traffic Engineering), where he is Professor of Civil Engineering, Emeritus and a Research Engineer. He is the first holder of the Robert Horonjeff endowed chair in the Department. During the period 1974-79, he served as Chairman of the Department of Civil Engineering.

Professor Monismith is internationally recognized for his work in the fields of pavement design and rehabilitation and asphalt paving technology. He has published extensively, and his papers have received awards from the Association of Asphalt Paving Technologists, the Transportation Research Board, and the American Society of Engineers. He was elected to the National Academy of Engineering in 1980. In 1988 he received the James Laurie Prize from ASCE for contributions to Transportation Engineering and was recently elected Honorary Member in that organization. In 1989 he was elected to Honorary Membership in the Association of Asphalt Paving Technologists and in 1990 to the Asphalt Institute's Role of Honor. In January 1992 he presented the First Distinguished Lecture at the annual meeting of the Transportation Research Board and received the Roy Crum Award in 1995 from that organization.

He serves or has served as a consultant on pavement research and design to the Asphalt Institute; Chevron Research Company; U.S. Army Corps of Engineers Waterways Experiment Station, Vicksburg, Mississippi; Transport Canada-Air; Woodward Clyde Consultants; Bechtel Corporation; ARE, Inc.; B.A. Vallerga Inc.; and the U.S. Air Force.

Professor Monismith is active in many professional societies. He has served as President of the Association of Asphalt Paving Technologists, Chairman of the Pavement Design Section of the Transportation Research Board as well as on numerous committees and panels of that organization, Chairman of the Board of Directors of the International Society for Asphalt Pavements in the 1988-90 period, and President of the San Francisco Section of the American Society of Civil Engineers. He is a registered civil engineer in California.

Résumé

CARL L. MONISMITH

The Robert Horonjeff Professor of Civil Engineering, Emeritus
and Research Engineer, The Institute of Transportation Studies
University of California
Berkeley, California 94720

EDUCATION

B.S. Civil Engineering, University of California, Berkeley, 1950
M.S. Civil Engineering, University of California, Berkeley, 1954

TECHNICAL EXPERIENCE

1951-date

Member, Faculty of Department of Civil Engineering
University of California at Berkeley

- Chairman of the Department, 1974-79
- Robert Horonjeff Professor of Civil Engineering, 1986-date

CONSULTING

Chevron Research Company
The Bechtel Corporation
Woodward Clyde Consultants
Transport Canada, Air
U. S. Air Force, AFWL

U. S. Army Waterways Experiment Station Vicksburg
The Asphalt Institute
ARE Inc.
SOHIO
Private engineering firms on pavement problems

PROFESSIONAL ACTIVITIES

Transportation Research Board, Associate

- Chairman, (1973-79) Pavement Design Section (Section B)
- Member, Committee A2B03, Flexible Pavement Design

Association of Asphalt Paving Technologists, Honorary Member

- President (1968-69)

American Society of Civil Engineers, Honorary Member

- Chairman, Committee on Pavement Design, Highway Division (1981-82)
- Member, Committee on Airfield Pavement
- Member, Committee on Curricula and Accreditation (1981-83)
- President, San Francisco Section (1979-80)
- Member, Educational Division Executive Committee (1987-89)
- Member, Educational Activities Committee, EdAC (1989-92)

American Society for Testing and Materials, Member

- Member, Committee D-4, Road and Paving Materials

American Society for Engineering Education, Member

American Association for the Advancement of Science, Fellow

PROFESSIONAL ACTIVITIES (Continued)

International Society for Asphalt Pavements

- Chairman, Executive Committee of Board of Directors, 1988-1990
- Member, Executive Committee of Board of Directors, 1988-to date

HONORS AND AWARDS

Chi Epsilon, Tau Beta Pi, Sigma Xi

Association of Asphalt Paving Technologists

- W. J. Emmons Award, 1961, 1965, 1985
- Honorable Mention to Emmons Awards, 1958, 1969
- Honorary Membership, 1989

Fulbright Grant

- University of New South Wales, Australia, 1971

Transportation Research Board

- K. B. Woods Award, 1972
- First Distinguished Lecturer, 1992
- Roy W. Crum Award, 1995

University of New South Wales, Australia

- Rupert Myers Medal, 1976

North Carolina State University

- Henry M. Shaw Lecturer in Civil Engineering, 1993

American Society of Civil Engineers

- State of the Art Award, 1978
- James Laurie Prize, 1988
- Honorary Member, 1995

The Asphalt Institute

- Roll of Honor, 1990

American Association for the Advancement of Science

- Fellow, 1993

National Academy of Engineering, 1980

University of California at Berkeley

- The Robert Horonjeff Professor of Civil Engineering (endowed chair)
- Berkeley Citation, 1996
- Distinguished Engineering Alumni Award, College of Engineering, 1996

REGISTRATION

Licensed Professional Civil Engineer, State of California

ARIZONA DEPARTMENT OF TRANSPORTATION BUDGET

Period of performance: December 1, 2002 through November 30, 2003

8/15/03 - 5/31/04

	Monthly Rate	Months	%	51 5% overhead 3/1/03 - 6/30/03	52% overhead 7/1/03 - 2/29/04
Personnel					
C L Monismith	\$16,633	1	Summer 10 0%	N/C	N/C
B W Tsai	\$5,950	4	cal yr 25 0%	\$5,950	
	\$5,950	3	25 0%		\$4,463
	\$6,069	5	25 0%		\$7,586
I Gunda	\$4,502	4	cal yr 10 0%	\$1,801	
	\$4,502	3	10 0%		\$1,351
	\$4,660	5	10 0%		\$2,330
H Matha	\$2,486	4	cal yr 21 0%	\$2,088	
	\$2,486	3	21 0%		\$1,566
	\$2,536	5	21 0%		\$2,663
C Scheffy	\$3,829	4	cal yr 5 0%	\$766	
	\$3,829	3	5 0%		\$574
	\$3,963	5	5 0%		\$991
M Paul	\$3,637	4	cal yr 4 0%	\$582	
	\$3,637	3	4 0%		\$436
	\$3,764	5	4 0%		\$753
Lab Assistant	\$2,437	4	cal yr 20 0%	\$1,950	
	\$2,437	3	20 0%		\$1,462
	\$2,486	5	20 0%		\$2,486
Contract Admin II, Step 3	\$3,235	4	cal yr 5 50%	\$712	
	\$3,235	3	5 50%		\$534
	\$3,300	5	5 50%		\$908
TOTAL PERSONNEL				\$13,849	\$28,103
Employee Benefits					
			Rates Per Period		
C L Monismith			17 0%	N/C	N/C
B W Tsai			17 0%	\$1,012	\$2,048
I Guada			23%	\$414	\$847
H Matha			23%	\$480	\$973
C W Scheffy			23%	\$176	\$360
M Paul			23%	\$134	\$273
Lab Assistant			23%	\$449	\$908
Contract Administrator			23%	\$164	\$332
TOTAL EMPLOYEE BENEFITS				\$2,829	\$5,741
TOTAL PERSONNEL & BENEFITS				\$16,678	\$33,844
Other Direct Costs					
Miscellaneous Research Supply Costs				\$2,143	\$1,532
TOTAL OTHER DIRECT COSTS				\$2,143	\$1,532
TOTAL DIRECT COSTS				\$18,821	\$35,376
Indirect Costs					
			MTDC		
51 5% of Mod Direct Costs for the period beginning on 12/1/02 and ending on 6/30/03	\$18,821			\$9,693	
52% of Mod Direct Costs for the period beginning on 7/1/03 and ending on 11/30/03			\$35,376		\$18,396
TOTAL INDIRECT COSTS				\$9,693	\$18,396
TOTAL AMOUNT REQUESTED PER PERIOD				\$28,514	\$53,772
TOTAL AMOUNT REQUESTED					\$82,286

¹ Projected salary rates include 2% cost of living increase effective every October 1st.

² Projected salary rates include 3.5% cost of living increase effective every October 1st

³ Items not subject to indirect costs